

What is claimed is:

1. A pressure regulator, comprising:

a housing;

an inlet in the housing receiving fluid reduced to a first pressure;

an outlet in the housing exhausting fluid compressed at a second pressure;

a passage connecting the inlet to the outlet;

a plug movably connected in the housing and disposed in the passage, the plug being movable between a range of positions extending from a first position closing the passage, to a second position fully opening the passage; and

a reverse pressure exhaust valve in the housing extending between the outlet and the inlet, the reverse pressure exhaust valve being normally closed, the reverse pressure exhaust valve opening when pressure within the outlet exceeds pressure within the regulator inlet by a predetermined amount.

2. The pressure regulator of claim 1, further including a spring in the housing biasing the plug into the fully open position.

3. The pressure regulator of claim 2, further including an adjustment mechanism for changing the degree of bias imparted by the spring.

4. The pressure regulator of claim 1, further including a filter disposed between the inlet and outlet.

5. The pressure regulator of claim 1, further including a moisture trap disposed between the inlet and outlet.

6. The pressure regulator of claim 1, wherein the reverse pressure exhaust valve is a one-way check valve having a movable plug mounted in a housing between an inlet and an outlet with a seat therebetween, a spring biasing the plug against the seat.

7. The pressure regulator of claim 1, wherein the size of the spring determines the predetermined amount, the predetermined amount being approximately six psi.

8. A valve system, comprising:

a control valve regulating flow of a process fluid;

a valve actuator coupled to the control valve, the valve actuator being driven

by pressurized fluid; and

a regulator operatively associated with the valve actuator, the regulator supplying fluid at a specified pressure to the valve actuator, the regulator including an inlet, an outlet, and a movable element therebetween, the regulator further including a reverse pressure exhaust valve adapted to connect the outlet to the inlet when the pressure within the outlet is greater than the pressure within the inlet by a predetermined amount.

9. The valve system of claim 8, further including a positioner, the positioner receiving a control signal and directing pressurized fluid from the regulator to the valve actuator based on the control signal.

10. The valve system of claim 8, wherein the reverse pressure exhaust valve is a one-way check valve, the check valve including a housing having an inlet, an outlet, a seat between the inlet and the outlet and a movable valve element biased against the seat by a spring.

11. The valve system of claim 10, wherein the spring biases the valve element toward the control valve outlet.

12. The valve system of claim 8, wherein the predetermined amount is a pressure differential of six psi.

13. The valve system of claim 8, wherein the regulator further includes a spring biasing the regulator movable element into an open position.

14. The valve system of claim 8, wherein the regulator further includes a filter between the inlet and the outlet.

15. The valve system of claim 8, wherein the regulator further includes a moisture trap between the inlet and the outlet.

16. A method of operating a control valve system, comprising:
 - directing pressurized fluid from a regulator to a valve actuator to change the position of the valve actuator;
 - changing the position of a control valve based on the change in position of the valve actuator; and
 - relieving excess pressure from the valve actuator when it is desired to have the control valve fail to a certain position, the excess pressure being relieved through a reverse pressure exhaust valve provided in the regulator.
17. The method of claim 16, wherein the excess pressure is exhausted when the pressure within an outlet of the regulator is greater than the pressure within an inlet of the regulator by a predetermined amount.
18. The method of claim 17, wherein the predetermined amount is six psi.
19. The method of claim 16, wherein the reverse pressure exhaust valve includes a spring-biased element, the excess pressure being exhausted when the pressure in an outlet of the regulator is greater than the pressure in an inlet of the regulator and a pressure differential therebetween creates a force sufficient to overcome a biasing force of the spring.
20. The method of claim 16, wherein the pressured fluid is directed from the regulator to the valve actuator by a positioner.
21. The method of claim 16, further including a step of having the positioner receive a signal representative of desired control valve position.
22. The method of claim 16, wherein the position of the valve actuator is changed by adjusting the pressure differential in the valve actuator.